

*Section of Neurology and Psychiatry, March 8, 1927*

# ON ASSOCIATED MOVEMENTS AS FOUND IN INVERTEBRATES AND VERTEBRATES INCLUDING MAN—A STUDY IN THE COMPARATIVE PHYSIOLOGY OF POSTURE

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- A— 1. Every “associated movement” in the present accepted sense of these words has as its cause a primary muscular movement. “Associated movements” are therefore secondary to this primary muscular movement.
2. The reflex arc for every “associated movement” carries stimuli arising in muscles on the afferent side, and stimuli passing to muscles on the efferent side.
3. The secondary movement or response is a postural response, that is, one which alters posture, and is limited to somatic musculature; I propose therefore to call “associated movements” *Postural Somatic Reflexes*. It is unnecessary to include the word muscular.
4. Thinking now of all groups of postural somatic reflexes, *i.e.*, any reflex which alters posture, we note that the stimulating impulse may arise either in muscles (example—voluntary contraction for eliciting associated movements), skin (example—pin prick), subcutaneous tissues (example—pressure), tendons or periosteal surfaces (example—tapping with a hammer).
5. The afferent parts of these arcs which excite postural somatic reflexes may be classified as myaesthetic and non-myaesthetic. It becomes apparent that all tendon reflexes such as the knee-jerk, and indeed all reflexes involving response in muscles, must have a stimulus which is either myaesthetic or non-myaesthetic.
6. Turning now to the responses to the above mentioned two groups of stimuli, we find that there may be somatic muscular responses, visceral or smooth muscular responses and visceral glandular responses. It

is only with the first that we are concerned at present.

7. The simplest postural response is that accompanying the stretch reflex of Sherrington and Lydell; in this the muscle contracts in response to its own stretching by mechanical means. This in its simplest form is the unimuscular somatic postural reflex.
  8. When tendon reflexes, periosteal reflexes, skin reflexes, such as radial periosteal and abdominal reflexes, are considered, we find that the muscles involved in the response are one or several. This is the second large category of somatic postural reflexes.
  9. The next most complicated somatic postural reflexes are those involving axial musculature or that of a single limb. The flexion reflex of the leg, as well as the muscular responses of "associated movements," are among these.
  10. The classification of postural patterns due to integration of neurone activity, previously described by the author, indicate the progressive combination of more and more complicated pictures of combined postures, until we reach that very complicated combination of simple postures manifested in human erectness. Thus there is demonstrable in man a sequence, from the most simple to the most complicated postural patterns.
  11. Automatic acts such as running, swimming, jumping, crawling, etc., are somatic postural reflexes of complicated character. In disease, as, for example, hemiplegia and Parkinsonism, the arcs for these reflexes may be disordered (example—gait, propulsion).
  12. All of the "associated movements" and automatic acts and postural responses, such as the signs of Kernig, Brudinzki, Marie and Foix, Hoover, etc., may easily be placed in this classification of postural patterns and their combinations.
- B— 1. The second part of the paper is devoted to an inquiry into the phylogeny of posture. Many difficulties of the subject were emphasized. The occurrence of the simplest patterns in the most ancient types of animals is illustrated by the powerfully-closed shell of the

oyster and clam in response to an attempt to open the shell (stretching).

2. A table was presented which suggested how the appearance of certain postural patterns in various animal groups from fish to man may be correlated with geological periods.
3. Postural somatic reflexes are one indication of the behavioristic possibilities of animals, and furthermore of the effect of the environment filtering through the particular nervous system which they may possess. Much may be gained from a comparative evolutionary study of postural somatic reflexes, since this will throw light upon the evolution of behavior.

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## SOME OBSERVATIONS ON THE DEVELOPMENT OF HUMAN MOTILITY AND ON MOTOR DISTURBANCES

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In order to study pathological movement and position reflexes in man it is necessary to know his normal movement and position reflexes. These normal phenomena were investigated in a series of over 120 children of all ages, according to the methods used by the school of Magnus and de Kleyn for their examination in animals.

In the new-born baby the neck-righting reflex is present; the labyrinthine-righting reflex and the body-righting reflex on the body are still incomplete. A certain number of babies have Magnus-de Kleyn reflexes in the arms. Human babies have during the first three months of life a peculiar extension reflex of the extremities to all kinds of sudden stimuli, such as loud noises, passive movements of the limbs, and especially passive movements in space. This is the so-called *Moro reflex*. In the second half of the first year babies have all the righting reflexes of quadrupedal animals, and they progress on all fours. Their neck-

righting reflex is positive. They sit up from the recumbent position by rotating around their body axis. In the second year of life they learn to stand on their legs, and this acquisition starts a gradual change of the whole motility which is completed at the age of about five years.

All the righting reflexes can be inhibited voluntarily, much more than in animals. The neck-righting reflexes and the Magnus-de Kleyn reflexes disappear. Children, as well as healthy adults, are able to stand up from the recumbent position by symmetrically lifting their bodies off the floor.

In pathological conditions of the righting reflexes, two definite syndromes can be distinguished: the decerebrate syndrome and the quadrupedal syndrome.

The *decerebrate syndrome* consists in increase of muscle tone, predilection of tone for the antigravity muscles, Magnus-de Kleyn reflexes (tonic neck reflexes) on the extremities, absent labyrinth and body-righting reflexes on the body; while the neck-righting reflexes may be present, and also a positive stretch reaction of the extremities to sudden stimuli such as noises, passive movements of the head or of the joints (Moro reflex). This Moro reflex may be very striking.

This syndrome is frequently found in tumors of the brain or ventricular hemorrhages which compress the midbrain. It may be partially present after all cerebral lesions of the pyramidal tracts (some examples are shown).

The *quadrupedal syndrome* consists in a return of the primitive form of standing up from the recumbent position by rotating around the spine, in a positive neck-righting reflex and in an instability of station which leads the patient to prefer a position on all fours. (This syndrome can be diagnosed only when the ventral muscle chains of the body are intact. It may be imitated by muscle dystrophy or severe muscle weakness of other origin.) The syndrome can be connected with a *lack of inhibition of the righting reflexes*, so that the patient is unable to remain quietly in the recumbent position.

It was found during epileptic attacks, in some cases of glioma of the temporal lobe, in an idiotic child, in cases with double athetosis, and in a child with a cerebellar tumor which had caused a large hydrocephalus.

Cerebellar lesions, however, do not produce this syndrome, as a rule. Cerebellar patients are able to sit up symmetrically, but they show a peculiar asynergy of this movement, described by Babinski, which consists in a throwing upward of the legs.

(Examples are shown both for the quadrupedal syndrome and for cerebellar asynergy.)

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## THE PERENNIAL TREATMENT OF SEASONAL HAY FEVER

AARON BROWN

In pollen hay fever, a diagnosis is made qualitatively as to the causal pollen factor or factors, and quantitatively as to the degree of sensitivity, the latter by the method of Cooke.

The pollen extracts used are prepared with Coca's alkaline extracting fluid and are standardized by their nitrogen content. By the intradermal method of skin testing, the pollen cases are put into various classes. The injections, amount, interval, and maximum dosage reached, depend upon the classification. The more sensitive the patient the less is the amount of the extract necessary to protect him.

Treatment is either pre-seasonal or seasonal. In the former treatment is begun two or three months prior to date of expected onset, injections being given at from five to seven-day intervals, to reach the maximum dosage in its class just before the hay fever season begins; in the latter, an effort is made rapidly to bring up the patient's immunity by injections being given daily or every other day. Injections are continued throughout the season.

At the present time treatment stops with the end of the pollen season, to be resumed again the following year. Whatever immunity has been built up in the patient is lost to a degree that has not heretofore been determined, making it necessary to start the treatment, each year, as though the case were a new one.